

No. 689,740.

Patented Dec. 24, 1901.

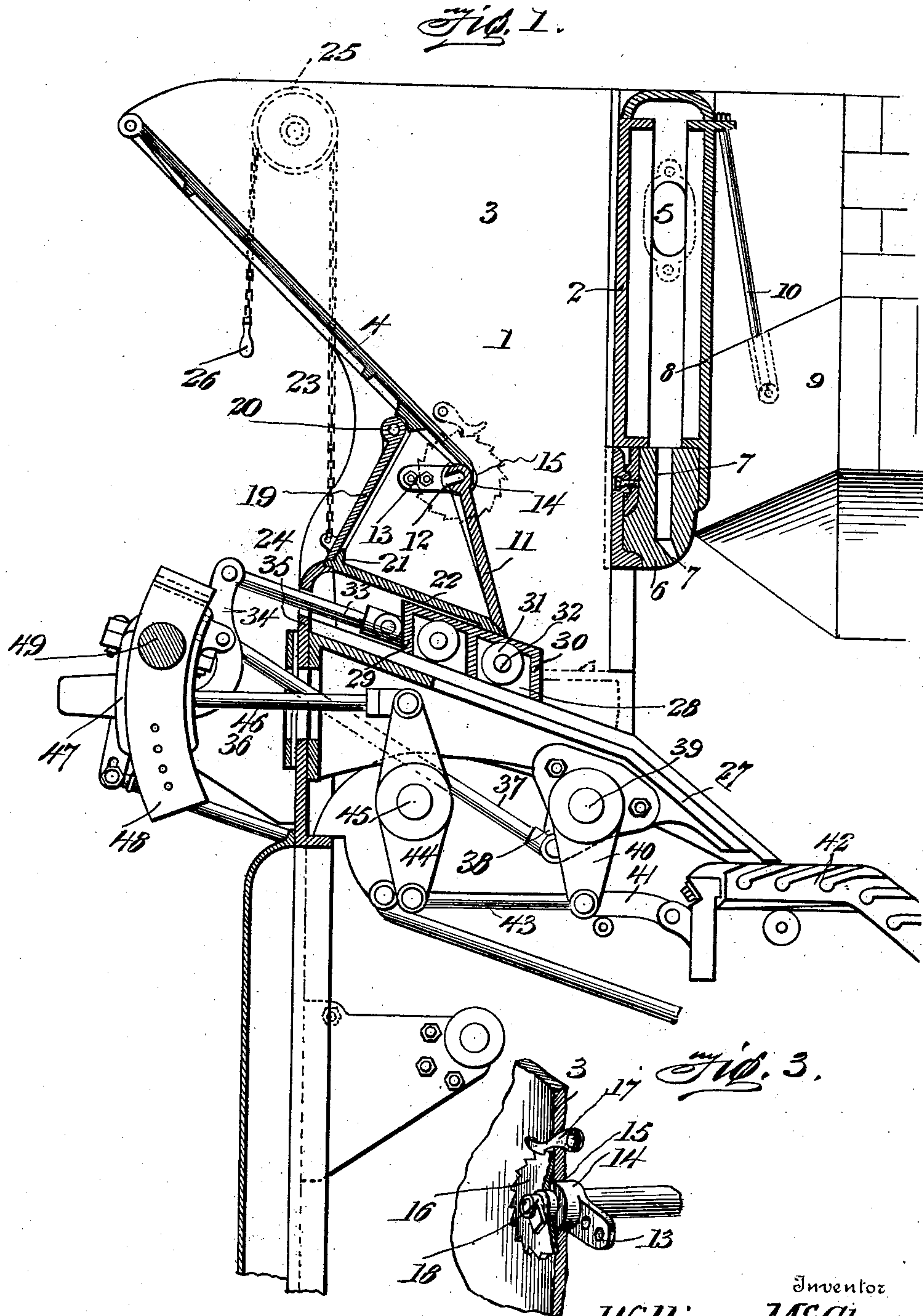
W. McCLAVE.

FUEL FEEDING MECHANISM FOR FURNACES.

(Application filed Feb. 13, 1901.)

(No Model.)

2 Sheets—Sheet 1.



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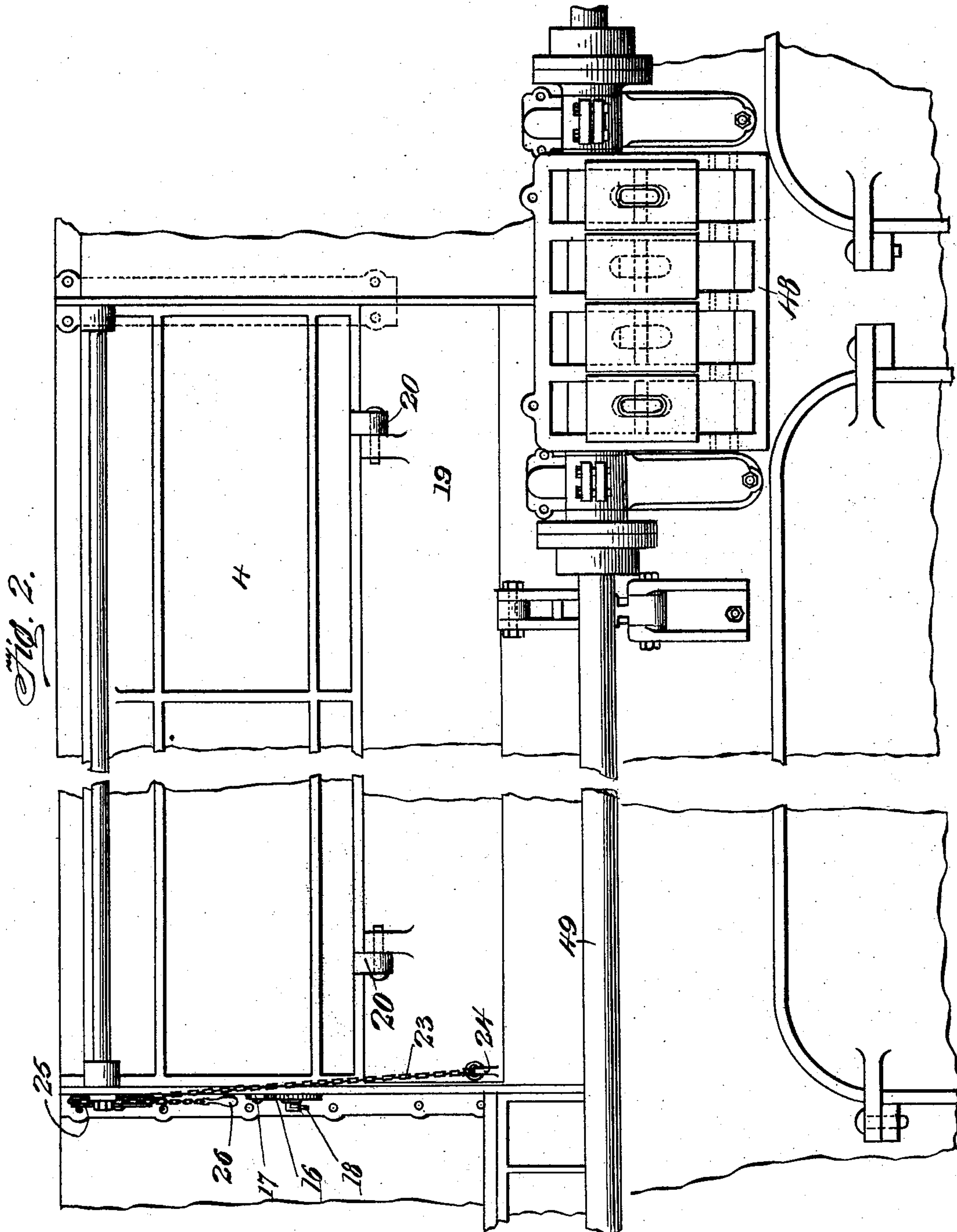
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FUEL-FEEDING MECHANISM FOR FURNACES.

SPECIFICATION forming part of Letters Patent No. 689,740, dated December 24, 1901.

Application filed February 13, 1901. Serial No. 47,164. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM MCCLAVE, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Fuel-Feeding Mechanism for Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in fuel-feeding mechanisms for furnaces whereby the fuel may be forced into the furnace regularly and uniformly and in greater or less quantities, as may be required, and is more particularly designed for supplying fuel to furnaces employing stoking-grates.

It also relates to improvements in mechanisms for furnaces for obtaining easy access to the interior of same and for the admission of air above the plane of the fire-surface when required.

It consists in stoking means for furnaces, comprising a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, said gate and door each adapted to close said opening, and a reciprocating pusher below the fuel-gate.

It further consists in stoking means for furnaces made up of a hopper for delivering fuel to the furnace, a passage-way being provided below said hopper which leads into the furnace, a gate for controlling the discharge of fuel from the hopper into said passage-way, a door arranged near the outer end of said passage-way for controlling the entrance of air thereto, and means for forcing the fuel from the passage-way into the furnace.

It further consists of certain other novel constructions and combinations, as will be hereinafter fully described and set forth.

In the accompanying drawings, forming part of this application, Figure 1 is a vertical transverse section through a stoking-hopper embodying my invention and also illustrating the arrangement of the same with respect to the dead-plate of the furnace-grate. Fig. 2

is a front elevation of the said hopper. Fig. 3 is a detail sectional view showing the manner of mounting the fuel-controlling gate in the hopper.

My improved stoking mechanism is well adapted for use in furnaces employing grates of all sorts, but is especially applicable to furnaces employing inclined grates which are adapted to assist in the stoking of fuel. My improved stoking-hopper is especially designed for use in connection with an inclined grate such as described and claimed by me in an application for patent of even date herewith, Serial No. 47,163. The hopper is so designed that fuel can be fed continuously and at a rate of speed corresponding with the speed at which the fuel is forced down the grate by the grate-operating mechanism itself, the structure being such also that the fuel can be checked to allow a chance to gain access to the top of the grate from the furnace-front when it is needful to bank the fire or to perform some other operation on the grate-surface. In this instance also the amount of air which is admitted to the top of the grate when the fires are banked can be controlled to a nicety. In constructing such a stoking-hopper I preferably arrange the same upon the front of the furnace immediately above the dead-plate thereof, the said hopper 1 being formed with a rear plate, as 2, end plates 3 3, and a front plate 4, which latter is inclined from the front toward the rear, as illustrated in Fig. 1 of the drawings. The rear plate 2 of the hopper is secured to the furnace-structure in such manner as to leave an air-space, as at 5, behind the same, whereby the hopper is protected from extreme heat, and this space may also be employed to supply air to the top of the grate, it being preferable to locate to the rear side of the plate 2 and below the air-spaces 5 a twyer 6, provided with suitable openings or passages, as 7 7, of appropriate size to admit the proper quantity of air to prevent the formation of smoke at the top of the grate. Another plate may be used, as at 8, similar to the rear wall of the hopper for forming the rear wall of the space 5. Some of the bricks, as 9, of the furnace-arch may be secured or suspended from the said plate 8 by means of suspending-rods 10, as illustrated in the drawings. This struc-

ture is convenient and forms a good backing for the hopper in a furnace of the character shown. This structure, however, is not essential to the invention, as other structures 5 may be employed in connection with the hopper.

At the lower end of the front plate 4 is suspended a swinging door or gate, as at 11, which is journaled at its ends in journal- 10 blocks 12, secured to the end walls 3 of the hopper. These journal-blocks 12 are preferably bolted, as at 13 13, to the inner surfaces of the said wall and are provided with journal-bosses 14 14, which project through ap- 15 ertures 15, formed in the said end walls 3. The trunnions formed at the ends of the said gate 11 extend through the said apertures, and at one end of the hopper one of the said trunnions is preferably extended a sufficient 20 distance to receive a ratchet-wheel, as 16, which is controlled by a pawl 17, pivoted to the end wall of the hopper. This trunnion also projects beyond the ratchet-wheel 16 and has secured to it a lever-stub, as 18, 25 which may be engaged by a socketed lever for turning the trunnion and swinging the door 11 at the bottom of the hopper. The swinging door 11 is so arranged that when it is swung upwardly its lower edge will meet the 30 lower edge of the rear wall of the hopper and may thus be made to completely shut off the flow of fuel from the hopper at any time. The said door 11 may be held in any desired position by the pawl 17 engaging the teeth of 35 the ratchet-wheel 16, and thus the door may be held in any intermediate position for regulating the amount of fuel which passes out of the hopper. The upper edge of the door 11 is preferably rounded, so as to fit snugly be- 40 neath the lower edge of the hopper-front 4, forming a close joint at this point no matter what the position of the said door.

It is desirable at all times to regulate the amount of air which may be permitted to en- 45 ter the furnace at the point where the fuel enters the same, and in order to have this within the complete control of the furnace operators I employ an outer swinging door 19, which is pivoted at suitable points—say 50 at 20 20—upon the front surface of the inclined wall 4 of the hopper. This gate at its lower edge is adapted to rest when closed against the sealing-rib, as at 21, formed upon a lower cross or bottom plate 22 of the hop- 55 per. By raising the door 19 from the said rib 21 a greater or less quantity of air may be permitted to enter the hopper at this point, or the air may be entirely excluded from the furnace when the hopper is feeding fuel to 60 the grate. A convenient mode of raising the said door 19 is illustrated in the drawings, in which it will be seen a chain, as 23, may be attached to the door by means of an apertured lug 24, formed thereon, the said chain 65 passing upwardly over a pulley 25, pivotally mounted on the end of the hopper. The free end of the chain will extend downwardly

from the said pulley 25 and may be provided with a handle, as 26, by which the said chain may be pulled. This handle 26 may be in 70 the form of a counterbalance for the door, if desired, so that the door may be held open at different positions for regulating the amount of air permitted to enter at this point. This door forms an important feature of the pres- 75 ent invention, for when the fuel is checked in its flow by closing the gate 11 a large space would be left open at the top of the grate through which air would be admitted, and this would be objectionable, since it would 80 permit the inflow of too large a quantity of air at this point. The door 19, therefore, may be advantageously used at this time to entirely exclude the air or to admit small or large quantities of the same. 85

The stoking-hopper is preferably arranged immediately above the dead-plate 27 of the furnace, and in order to force the fuel downwardly from such dead-plate as it drops from the hopper I employ a reciprocating slide or 90 pusher, as at 28, which is adapted to work between the upper surfaces of the dead-plate and the lower surfaces of the hopper-bottom plate 22. The lower edge of the said bottom plate 22 is preferably arranged to come very 95 closely to the upper edge of the said pusher 28, so that the fuel will not be carried upwardly behind the said plate by the action of the pusher 28. The pusher 28 is made of an elongated body portion having downwardly- 100 projecting strengthening-webs. Two of the said webs, as 29 and 30, form the front and rear walls of the pusher, respectively. While the pusher may be constructed to operate upon a horizontal dead-plate, it is preferable 105 to employ an inclined dead-plate, as shown in the drawings, and to construct the said pusher of such shape as to be capable of action between an inclined dead-plate and an inclined bottom plate 22, I therefore ar- 110 range the walls 29 and 30 and the strengthening-ribs in a vertical plane, the upper surfaces of the said pusher being inclined thereto. The forward edge of the pusher is adapt- 115 ed to extend a suitable distance beyond the front edge of the plate 22 and will force all fuel which drops in front of the same from the hopper down to the dead-plate and onto the top of the grate. In order to render the operation of the pusher without a great deal 120 of friction, I preferably mount the pusher on antifriction-rollers, as at 31, which are preferably pivoted upon studs 32, secured to the inner surfaces of the end walls of the pusher. These antifriction-rollers 31 project suffi- 125 ciently below the lower edge of the pusher to support the same at a slight distance from the surface of the dead-plate. In order to reciprocate the said pusher, I connect the same, by means of rods or links 33, with actuating-arms 130 34 outside the furnace-front, the said links 33 projecting through suitable openings in the said front. These arms 34 are pivoted upon brackets 36, which are riveted to the furnace-

front 35. Motion may be imparted to these actuating-arms 34 34 in any desired manner; but I preferably operate the same in connection with the grate-operating mechanism illustrated and described in the application for patent above referred to. This manner of operating the mechanism, it will be seen, consists in connecting the said arms, by means of links or rods 37, with arms 38, secured to the rock-shaft 39, which is mounted beneath the dead-plate 27. The shaft 39 may be rocked in any suitable manner, but is preferably operated in conjunction with the movement of the stoking-grate bars of the furnace-grate. As shown in the drawings, the rock-shaft is provided with an arm 40, which is connected, by means of link 41, with the upper grate-bar 42, the said arm being also connected, by means of another link 43, with an actuating rocking lever 44. This lever 44 is loosely pivoted upon the shaft 45, which is arranged just inside the furnace-front. The upper end of the rocking lever 44 is connected, by means of a link 46, with an adjustable block 47, arranged in a swinging yoke 48. A power rock-shaft, as 49, is arranged outside the furnace-door and carries the yoke 48. The block 47 is adjustable in the yoke 48, as described in the application referred to above, and therefore needs no further description in this application. The rocking of the shaft 48 will thus transmit motion through the links and levers described to the rock-shaft 39, and the arms 34, above described, will cause a reciprocation of the pusher 28 in correspondence with the movement of the upper grate-bar 42. This is desirable, since the pusher will always supply enough fuel to occupy the space left by the fuel pushed down the grate through the operation of the upper grate-bar and will prevent the forming of a gap in the fuel at this point. It would be also undesirable to force a greater quantity of fuel upon the grate than could be disposed of by the upper grate-bar, as this would cause the fuel to pile up on the grate at this point. It will of course be apparent that I might use any direct means for operating the pusher 28 without departing in the least from the spirit of my invention.

In furnaces employing two or more grate-sections it is preferable to provide a hopper for each grate-section, and each hopper will be provided with its own gate 11, door 19, and pusher 28. Of course a hopper could be constructed to extend entirely across one furnace whether the same had two or more grate-sections; but this would render the doors unnecessarily heavy and more difficult to operate, and the more desirable way is to provide a separate hopper for each grate-section.

From the above description it will be apparent that my improved stoking-hopper is well adapted for use in connection with inclined stoking-grates and capable of adjustment to accommodate itself to a grate or fur-

nace to which it might be applied. The use of the door 19 in connection with the gate 11 makes it possible also to gain access to the upper surface of the grate at any time without having to empty the hopper of its fuel, a feature which has not been heretofore embodied in hopper mechanisms of a similar character.

While I have shown the door 19 as pivoted at its upper edge, it will be evident that it can be pivoted at its lower edge and opened downwardly. It also might be hinged at its end or could be hinged at both ends and open from the center each way, all within the spirit of the invention.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, said gate and door each adapted to close said opening and a reciprocating pusher below the fuel-gate, substantially as described.

2. In stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace arranged above the dead-plate of said furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a pivoted door on the front wall of the hopper, said gate and door being each adapted to close the said opening and a reciprocating pusher adapted to travel back and forth on the dead-plate beneath the hopper for forcing the fuel into the furnace, substantially as described.

3. In a stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, means for swinging the gate on its pivotal points and holding it in various adjustable positions, a door pivoted on the front wall of the hopper, said gate and door being each adapted to close said opening, and means below the fuel-gate for forcing fuel into the furnace, substantially as described.

4. In stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a ratchet-wheel secured to one of the trunnions of said gate, a pawl for holding the same, a lever-stub secured to the end of one of the gate-trunnions, whereby a socketed le-

ver may be employed for operating the swinging gate, a door pivoted to the front wall of the hopper, said gate and door being each adapted to close said opening, and reciprocating means below the hopper for forcing fuel into the furnace, substantially as described.

5. In stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, the said gate and door being both adapted to close said opening, a reciprocating pusher below the fuel-gate, and wheels supporting said pusher, whereby it may be easily moved back and forth, substantially as described.

6. In stoking means for furnaces, the combination of a hopper for delivering fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, the gate and door being both adapted to close said opening, a reciprocating pusher below the fuel-gate, actuating-arms mounted outside the furnace-front and connected with the pusher, and means for moving the arms back and forth upon their pivotal points for reciprocating the pusher, substantially as described.

7. In stoking means for furnaces, the combination with a hopper for delivering the fuel to the furnace, said hopper being provided near the lower portion of its rear wall with an opening, a swinging gate at the bottom of the hopper, for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, the gate and door being both adapted to close said opening, a reciprocating pusher located below the hopper, links pivotally connecting the said pusher with operating means outside the furnace-front, levers pivoted to said front and connected with said links, a rock-shaft mounted beneath the dead-plate of the furnace for connecting the said levers, and adjustable means for varying the extent to which the shaft is rocked, whereby a greater or less force may

be imparted to the pusher when it is reciprocated, substantially as described.

8. In stoking means for furnaces, the combination with a hopper provided near the lower portion of its rear wall with an opening, of a swinging gate at the bottom of the hopper, for controlling the discharge of fuel therefrom, a door pivoted to the front wall of the hopper, said gate and door being each adapted to close said opening, a reciprocating pusher beneath the fuel-gate, a rock-shaft mounted beneath the dead-plate gate and connected with said pusher for actuating the same, one or more of the grate-bars of the furnace being connected with the said rock-shaft, levers and links connecting said rock-shaft with a swinging yoke outside the furnace-front, means for varying the amount of movement imparted by the yoke, an outer shaft carrying said yoke, the construction being such that motion will be imparted to the pusher beneath the hopper, which corresponds exactly with the motion imparted to one or more of the grate-bars of the furnace, substantially as described.

9. In stoking means for furnaces, the combination of a hopper arranged above the dead-plate of the furnace, a passage-way being formed between the dead-plate and the hopper for admitting air to the top of the furnace-grate, a bottom plate in said passage-way forming between it and the dead-plate, a recess for a pusher for forcing fuel from the passage-way into the grate, a swinging gate at the lower end of the hopper's front wall, adapted to control the discharge of fuel from the bottom of the hopper, said gate when in its open position resting against the said plate in the passage-way, a door pivoted to the front wall of the hopper and engaging a flange on the passage-way plate, and means for raising and lowering the door whereby air may be admitted to the passage-way at this point or may be entirely shut off from the same, substantially as described.

In testimony whereof I hereunto affix my signature in presence of two witnesses.

WILLIAM MCCLAVE.

Witnesses:

FENTON S. BELT,
RICHARD B. CAVANAGH.